CLAIMS

What is claimed is:

1. An electromagnetic transducer comprising:

a first magnetically conductive member;

a second magnetically conductive member;

a first non-magnetically conductive thermally conductive member disposed between the first and second magnetically conductive members; and

a plurality of third magnetically conductive members disposed within voids in the thermally conductive member and magnetically coupling the first magnetically conductive member to the second magnetically conductive member;

wherein the thermally conductive member includes outwardly extending members between which the voids are defined to conduct heat outwardly between the third magnetically conductive members.

2. The electromagnetic transducer of claim 1 wherein:

at least one of the first and second magnetically conductive members comprises a permanent magnet.

3. The electromagnetic transducer of claim 2 wherein:

the third magnetically conductive members comprise soft magnetic material members.

4. The electromagnetic transducer of claim 2 wherein:

the third magnetically conductive members comprise permanent magnets.

5. The electromagnetic transducer of claim 1 wherein:

at least one of the first and second magnetically conductive members comprises a soft magnetic material member.

6. The electromagnetic transducer of claim 5 wherein:

the third magnetically conductive members comprise soft magnetic material members.

7. The electromagnetic transducer of claim 6 wherein:

a subset of the third magnetically conductive members comprise permanent magnets.

8. The electromagnetic transducer of claim 1 wherein the non-magnetic thermally conductive member comprises:

a heatsink comprising aluminum.

9. The electromagnetic transducer of claim 8 wherein:

the heatsink is configured as a speaker basket.

10. The electromagnetic transducer of claim 1 wherein:

the first non-magnetically conductive thermally conductive member is configured as a speaker basket.

11. The electromagnetic transducer of claim 1 wherein:

the third magnetically conductive members comprise extensions integrally constructed with the first magnetically conductive member.

12. The electromagnetic transducer of claim 1 wherein the thermally conductive member further comprises:

a first electrically conductive ring coupled to the outwardly extending members.

13. The electromagnetic transducer of claim 12 wherein:

one of the first and second magnetically conductive members comprises a ring magnet having an inner dimension; and

the first electrically conductive ring extends axially between the inner dimension of the ring magnet and a pole piece of the electromagnetic transducer.

14. The electromagnetic transducer of claim 12 wherein the thermally conductive member further comprises:

a second electrically conductive ring coupled to the outwardly extending members, wherein the first and second electrically conductive rings are disposed on opposite sides of a magnetic air gap of the electromagnetic transducer.

15. The electromagnetic transducer of claim 1 wherein:
the third magnetically conductive members are substantially wedge shaped.

16. The electromagnetic transducer of claim 1 wherein:
the third magnetically conductive members are substantially round shaped.

17. The electromagnetic transducer of claim 1 further comprising:
a second non-magnetic thermally conductive member; and
a plurality of fourth magnetically conductive members disposed within voids in the second thermally conductive member and magnetically coupled to the first magnetically conductive member.

18. The electromagnetic transducer of claim 1 wherein:
the electromagnetic transducer comprises a motor having an external magnet geometry.

19. The electromagnetic transducer of claim 1 wherein:
the electromagnetic transducer comprises a motor having an internal magnet geometry.

20. The electromagnetic transducer of claim 19 wherein:
the first magnetically conductive member comprises a lower portion of a cup;
the second magnetically conductive member comprises an upper portion of the cup.

21. The electromagnetic transducer of claim 1 further comprising:
a substantially radial ventilation hole through at least one of the outwardly extending members of the thermally conductive member.

22. The electromagnetic transducer of claim 21 wherein:
the ventilation hole is surrounded by material of the outwardly extending member.

23. The electromagnetic transducer of claim 1 comprising:
a push-pull magnetic circuit.

24. The electromagnetic transducer of claim 23 wherein:

the first and second magnetically conductive members comprise upper and lower ring plates, respectively;

the third magnetically conductive members comprise hard magnet segments; and

wherein the electromagnetic transducer further comprises,

a plurality of plate connectors magnetically coupling the upper and lower gap rings to the hard magnet segments.

25. The electromagnetic transducer of claim 24 wherein:

the plurality of plate connectors comprises an upper plate connector segment and a lower plate connector segment for each of the hard magnet segments.

26. The electromagnetic transducer of claim 25 wherein:

the outwardly extending members comprise webs which extend axially between adjacent plate connectors.

27. The electromagnetic transducer of claim 25 wherein:

the thermally conductive member comprises a speaker basket.

28. An audio speaker motor structure having an external magnet motor geometry and comprising:

a pole piece;

a stack of at least two magnetically conductive members, the stack including,

at least one permanent magnet, and

at least one plate defining at least one magnetic air gap with the pole piece; and

a thermally conductive heatsink including,

an inner ring, and

a plurality of thermally conductive webs coupled to the inner ring;

wherein at least one of the magnetically conductive members in the stack comprises,

a plurality of segmented members disposed between the webs of the heatsink.

29. The audio speaker motor structure of claim 28 wherein:
the plurality of segmented members together comprise the permanent magnet.

30. The audio speaker motor structure of claim 28 wherein:
the plurality of segmented members together comprise a soft magnet.

31. The audio speaker motor structure of claim 30 wherein:
the plurality of segmented members together comprise the plate.

32. The audio speaker motor structure of claim 28 further comprising:
the heatsink further comprises a speaker basket.

33. The audio speaker motor structure of claim 28 further comprising:
a second such heatsink; and
wherein a second one of the magnetically conductive members in the stack comprises,
a second plurality of segmented members disposed between the webs of the second heatsink.

34. The audio speaker motor structure of claim 28 wherein:
the inner ring of the heatsink is electrically conductive.

35. The audio speaker motor structure of claim 34 wherein:
the heatsink further includes an outer body coupled to the webs, and the heatsink as a whole is electrically conductive.

36. The audio speaker motor structure of claim 28 further comprising:
the first thermally conductive heatsink further including,
an outer member coupled to the webs;
a second thermally conductive heatsink including,
an inner ring,
an outer member, and
a plurality of thermally conductive webs coupling the inner ring to the outer member; and

a plurality of magnetically conductive members disposed between the webs of the second thermally conductive heatsink.

37. The audio speaker motor structure of claim 28 comprising:

a push-pull magnetic circuit.

38. An audio speaker motor structure having an internal magnet motor geometry and comprising:

a lower cup portion including an outer rim and an inner base surface;

a permanent magnet magnetically coupled to the inner base surface of the lower cup portion;

a plate magnetically coupled to the permanent magnet;

a thermally conductive heatsink coupled to the outer rim of the lower cup portion and including,

an inner ring, and

a plurality of webs coupled to the inner ring;

a plurality of magnetically conductive members disposed between the webs of the heatsink and coupled to the lower cup portion; and

an upper cup portion coupled to the plurality of magnetically conductive members.

39. The audio speaker motor structure of claim 38 wherein:

the plurality of magnetically conductive members comprises soft magnets.

40. The audio speaker motor structure of claim 39 wherein:

a subset the plurality of magnetically conductive members comprises permanent magnets.

41. The audio speaker motor structure of claim 38 wherein the heatsink further includes:

an outer body coupled to the webs.

42. A method of cooling an audio speaker motor structure, the method comprising:

conducting magnetic flux from a first magnetic material member, through a plurality of second magnetic material members, to a third magnetic material member;

wherein the first magnetic material member, the second magnetic material members, and the third magnetic material member are disposed at different axial positions along an axis of the audio speaker motor structure;

wherein there are spaces between adjacent ones of the plurality of second magnetic material members;

absorbing heat by an inner ring which is coaxially disposed adjacent the second magnetic material members; and

conducting the heat from the inner ring through a plurality of webs which are coupled to the inner ring and which are disposed between respective adjacent ones of the second magnetic material members, to an outer heatsink member.

43. The method of claim 42 further comprising:

sinking electrical eddy current in the inner ring, in response to generation of the eddy current by a voice coil of the audio speaker motor structure.

44. The method of claim 43 further comprising:

sinking electrical eddy current through the outer heatsink member.

45. The method of claim 42 wherein:

conducting the heat from the inner ring through the webs to the outer heatsink member comprises conducting the heat to a basket of an audio speaker which includes the audio speaker motor structure.

46. The method of claim 42 further comprising:

passing ventilation air through a hole in the plurality of webs, the air flowing between an inside of the audio speaker motor structure and an outside of the audio speaker motor structure.